JC10 Rec'd PCT/PTO 28 JAN 2002

| FORM PTO-1390 U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE (REV 11-2000) | ATTORNEY'S DOCKET NUMBER<br>449122022600 |
|---|---|
| **TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. § 371** | U S APPLICATION NO (If known, see 37 CFR 1 5)<br>10/048119<br>Not yet assigned |

| INTERNATIONAL APPLICATION NO. | INTERNATIONAL FILING DATE | PRIORITY DATE CLAIMED |
|---|---|---|
| PCT/DE00/02505 | July 28, 2000 | July 30,1999 |

TITLE OF INVENTION

**METHOD FOR OPTIMIZING THE TRANSMISSION OF DATA VIA LINES**

APPLICANT(S) FOR DO/EO/US

**Reiner GIECK**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. [x] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S C 371
3. [ ] This is an express request to begin national examination procedures (35 U.S C 371(f)). The submission must include items (5), (6), (9) and (21) indicated below
4. [x] The US has been elected by the expiration of 19 months from the priority date (PCT Article 31)
5. [x] A copy of the International Application as filed (35 U S C 371(c)(2))
   a. [x] is attached hereto (required only if not communicated by the International Bureau).
   b. [x] has been communicated by the International Bureau
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] An English language translation of the International Application under PCT Article 19 (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Application under PCT Article 19 (35 U S C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau)
   b. [ ] have been communicated by the International Bureau
   c. [✓] have not been made; however, the time limit for making such amendments has NOT expired
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U S.C. 371(c)(3)).
9. [ ] An oath or declaration of the inventor(s) (35 U S C. 371(c)(4)).
10. [ ] An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S C. 371(c)(5)).

**Items 11. to 16. below concern document(s) or information included:**

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording A separate cover sheet in compliance with 37 CFR 3 28 and 3 31 is included
13. [ ] A FIRST preliminary amendment
14. [ ] A SECOND or SUBSEQUENT preliminary amendment
15. [ ] A substitute specification
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter 2 and 35 U S C 1 821 - 1 825
18. [ ] A second copy of the published international application under 35 U S.C 154(d)(4)
19. [ ] A second copy of the English language translation of the international application under 35 U S C 154(d)(4).
20. [x] Other items or information 1) Application Data Sheet; 2)Int'l Search Report; 3) IPER; 4) Return receipt postcard.

**CERTIFICATE OF HAND DELIVERY**

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on January 28, 2002.

Melissa Garton

Melissa Garton

dc-296966

531 Rec'd PCT/PTO 28 JAN 2002

| U.S. APPLICATION NO. (if known, see 37 CFR 1.5) Not yet assigned 10/048119 | INTERNATIONAL APPLICATION NO PCT/DE00/02505 | ATTORNEY DOCKET NO 449122022600 |
|---|---|---|

21. ☒ The following fees are submitted:

**BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):**

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..........................$1,000.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO......................$890.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO............................$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provision of PCT Article 33(1)-(4) .............................$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ....................................$100.00

| | | | | CALCULATIONS | PTO USE ONLY |
|---|---|---|---|---|---|
| | | | **ENTER APPROPRIATE BASIC FEE AMOUNT =** | $890.00 | |
| Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | | | $0 | |
| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | | |
| Total claims | - 20 = | | x $18.00 | $0 | |
| Independent claims | - 3 = | | x $80.00 | $0 | |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) | | | + $270.00 | $0 | |
| | | | **TOTAL OF ABOVE CALCULATIONS =** | $890.00 | |
| ☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½. | | | | $0 | |
| | | | **SUBTOTAL =** | $890.00 | |
| Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). + | | | | $0 | |
| | | | **TOTAL NATIONAL FEE =** | $890.00 | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 per property** + | | | | $0 | |
| | | | **TOTAL FEES ENCLOSED =** | $890.00 | |
| | | | | **Amount to be refunded:** | $ |
| | | | | **charged:** | $ |

a. ☒ Please charge my **Deposit Account No. 03-1952** (referencing Docket No. 449122022600) in the amount of $890.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

b. ☒ The Commissioner is hereby authorized to charge any additional fees that may be required, or credit any overpayment to **Deposit Account No. 03-1952** (referencing Docket No. 449122022600).

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

Kevin R. Spivak
Registration No. 43,148

January 28, 2002

06966

CERTIFICATE OF HAND DELIVERY

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on June 10, 2002.

Mildred I. Ayim

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

Reiner GIECK

Serial No.: 10/048,119

Filing Date: January 28, 2002

For: PROCEDURE FOR OPTIMIZING DATA TRANSMISSION VIA LINES

Examiner: Not yet assigned

Group Art Unit: Not yet assigned

# PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please amend this application as follows:

**In the Claims:**

1. A method of data transmission, comprising:

determining and storing at least one transmission method, with at least one transmission speed that represents a data throughput rate, in memory for different line parameters of lines;

measuring the line parameters of the line using the at least one transmission method; and

selecting the at least one transmission method having the transmission speed in which the measured and stored line parameters are most compatible.

2. The method according to claim 1, wherein the line parameters are represented by the attenuation and running time of the line and by interference signals on the line.

3. The method according to claim 2, wherein the running time is determined by a measurement of the phase difference between two signals with different frequencies, one of the two signals formed according to the transmission method.

4. The method according to claim 1, wherein the maximum data throughput rate for different line parameters is determined with different transmission methods and transmission speeds, by selecting the transmission methods in the frequency range of which the line parameters of attenuation and running time demonstrate the least amount of variations, and in which the interference of the measured interference signal has the least effect, and the line parameters that represent the maximum throughput rate are stored in memory.

5. The method according to claim 1, wherein before the start of a data transmission, a measurement procedure is initiated, the procedure comprising:

determining which end of the line is a central end and which end of the line is a decentral end,

measuring interference of the line before the line parameters are measured at the central end,

selecting and reporting a transmission method to the decentral end,

sending a predetermined test signal by the central end, at two different frequencies, based on the line parameters stored in memory for the selected transmission method, and the line parameters of the test signal are measured by the decentral end, and a test signal is transmitted to the central end by the decentral end,

checking an attenuation of the test signal at the central end, and, as function of the measured attenuation, additional test signals at two different frequencies are transmitted to the decentral end,

repeating the sending and checking until the line parameters stored in memory have been worked off, and

comparing the measured line parameters with the line parameters stored in memory, and determining the transmission method and the transmission speed as a function of the comparison.

6. The method according to claim 5, wherein the line parameters stored in memory are stored in tables, such that the tables are assigned to the different transmission methods with different speeds, and the selection of a transmission method for determining the line parameters and for determining the transmission method with the maximum throughput rate occurs by a comparison of the determined line parameters stored in the tables.

7. The method according to claim 6, wherein transmission units are each connected at ends of the line, where a communications terminal is connected to one transmission unit, and a communications system is connected to the other transmission unit.

8. The method according to claim 7, wherein the transmission methods are represented by synchronous or asynchronous base band transmission methods, or by a single-carrier or multi-carrier frequency transmission method.

9. The method according to claim 8, wherein the AMI method, HDB3 method, coded diphase method, or 2B1Q method is provided as the base band transmission method, and the QAM method with different step numbers and the phase difference method is provided as the carrier frequency transmission method.

**In the Abstract:**

Please replace the Abstract with the substitute Abstract attached hereto.

## REMARKS

Amendments to the specification have been made and are submitted herewith in the attached Substitute Specification. A clean copy of the specification and a marked-up version showing the changes made are attached herewith. The claims and abstract have been amended in the attached Preliminary Amendment. All amendments have been made to place the application in proper U.S. format and to conform with proper grammatical and idiomatic English. None of the amendments herein are made for reasons related to patentability. No new matter has been added.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**".

In the event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 449122022600.

Respectfully submitted,

Dated: June 10, 2002

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

For the convenience of the Examiner, the changes made are shown below with deleted text in strikethrough and added text in underline.

**In the Claims:**

**What is claimed is:**

~~1. Method for optimizing~~ **1. A method of** data transmission, **comprising:**

**determining and storing** at least one transmission method**,** with at least one transmission speed that represents **a** data throughput rate**,** in memory for different line parameters of lines~~,~~**;**

**measuring** the line parameters of **the** lin**e** using **the** at least one transmission method**; and**

**selecting the at least one**~~-~~ transmission method **having the** transmission speed **in which** the measured and stored line parameters **are most compatible.**

~~2.~~ **2. The method** according to **claim** 1, **wherein** the line parameters are represented by the attenuation and running time of the line and by interference signals on **the** line.

3. ~~Method~~ **The method** according to **claim** 2, **wherein** the running time is determined by a measurement of the phase difference between two signals with different frequencies, one of the **two signals** formed according to **the** transmission method.

4. ~~Method~~ **The method** according to **claim 1, wherein** the maximum data throughput rate for different line parameters ~~are~~ **is** determined with different transmission methods and transmission speeds, by ~~of~~ **selecting the** transmission methods in the frequency range of which the line parameters of attenuation and running time demonstrate the least **amount of** variations, and **in** which the interference of the measured interference signal has the least effect, and the line parameters that represent the maximum throughput rate are stored in memory.

5. ~~Method~~ **The method** according to **claim 1, wherein** before the start of a data transmission, a measurement procedure is initiated, **the procedure comprising:**

**determining which** end of the line ~~the~~ **is a** central end **and which end of the line is a** decentral end,

**measuring interference of the line** before the line parameters are ~~measures~~ **measured at the central end**,

**selecting and reporting** a transmission method to the decentral end,

**sending a predetermined test signal by the central end, at two different frequencies,** based on the line parameters stored in memory for the selected transmission method, and the line parameters of the test signal are measured by the decentral ~~end~~ **end, and** a test signal is transmitted to the central end by the decentral end,

~~the~~ **checking an** attenuation of the test signal at the central end, and, as function of the measured attenuation, additional test signal**s** at two different frequencies are transmitted to the decentral end,

**repeating the sending and checking** until the line parameters stored in memory have been worked off, and

**comparing** the measured line parameters with the line parameters stored in memory, and **determining** the transmission method and the transmission speed as a function of the comparison.

6. ~~Method~~ **The method** according to **claim** 5, **wherein** the line parameters stored in memory are stored in tables, **such that** the tables are assigned to the different transmission methods with different speeds, and the selection of a transmission method for determining the line parameters and for determining the transmission method with the maximum throughput rate **occurs** by a comparison of the determined line parameters stored in the tables.

7. ~~Method~~ **The method** according to claim **6**, **wherein** transmission units **are each** connected **at** ends of the line, where a communications terminal is connected to one transmission unit, and a communications system is connected to the other transmission unit.

8. ~~Method~~ **The method** according to claim **7**, **wherein** the transmission methods are represented by synchronous or asynchronous base band transmission methods, or by a single-carrier or multi-carrier frequency transmission method.

9. ~~Method~~ **The method** according to **claim** 8, **wherein** the AMI method, HDB3 method, coded diphase method, or 2B1Q method is provided as the base band transmission method, and the QAM method with different step numbers and the phase difference method is provided as the carrier frequency transmission method.

Amended Claims

1. Method for optimizing data transmission via lines (L),

- wherein at least one transmission method (BB1, BB2) with at least one transmission speed that represents the data throughput rate is determined and stored in memory for different line parameters (lp`) of lines (L),
- wherein the line parameters (lp) of a line (L) are measured using at least one transmission method (BB1, BB2),
- wherein that transmission method (BB1, BB2) with that transmission speed is selected, at which the greatest agreement of the measured and stored line parameters (lp, lp`) is found.

2. Method according to Claim 1, [characterized in that] the line parameters (lp) are represented by the attenuation and running time (lz) of the line and by interference signals (rs) on a line (L).

3. Method according to Claim 2, characterized in that the running time (lz) is determined by means of a measurement of the phase difference (pd) between two signals (ts) with different frequencies, one of them formed according to a transmission method (BB1, BB2).

4. Method according to one of the preceding claims, characterized in that the maximum data throughput rate for different line parameters (lp`) are [*sic*] determined with different transmission methods BB1, BB2 and transmission speeds, by selection of those transmission methods BB1, BB2 in the frequency range of which the line parameters (lp) of attenuation and running time (lz) demonstrate the least

variations, and with which the interference of the measured interference signal (rs) has the least effect, in addition, and that the line parameters (lp`) that represent the maximum throughput rate are stored in memory.

5. Method according to one of the preceding claims, characterized in that
before the start of a data transmission, a measurement procedure is initiated, by means of which

a) one end of the line (L) is determined to be the central end (M) and the other is determined to be the decentral end (S),
b) before the line parameters (lp) are measures, the basic interference, i.e. the background noise (rs) of the line (L) is measured,
c) after analysis of the measured basic interference by the central end (M), a transmission method (BB1, BB2) is selected and reported to the decentral end (S),
d) based on the line parameters (lp) stored in memory for the selected transmission method (BB1, BB2), a predetermined test signal (ts) is sent out by the central end (M), at two different frequencies, in each instance, and that the line parameters (lp) of the test signal (ts) are measured by the decentral end (S), whereupon a test signal (ts) is transmitted to the central end (M) by the decentral end (S),
e) the attenuation of the test signal (ts) is checked at the central end (M), and, as function of the measured attenuation, additional test signals (ts) at two other different frequencies are transmitted to the decentral end (S),
f) steps d) and e) are repeated until the line parameters stored in memory (lp) [*sic*] have been worked off, and
g) the measured line parameters (lp) are compared with the line parameters (lp`) stored in memory, and the

transmission method (BB1, BB2) and the transmission speed are determined as a function of the comparison result.

6. Method according to Claim 5, characterized in that the line parameters stored in memory (lp`) are stored in tables (T1-Tn), where the tables (T1-Tn, TD) are assigned to the different transmission methods (BB1, BB2) with different speeds, and that the selection of a transmission method (BB1, BB2) for determining the line parameters (lp) and for determining the transmission method with the maximum throughput rate takes place by means of a comparison of the determined line parameters (lp) and the line parameters (lp`) stored in the tables (T1-Tn, TD).

7. Method according to one of the preceding claims, characterized in that it is provided in a transmission units [*sic*] (UE), each connected with the ends of the line (L), where a communications terminal (KE) is connected to one transmission unit (UE), and a communications system (KS) is connected to the other transmission unit (UE).

8. Method according to one of the preceding claims, characterized in that the transmission methods (BB1, BB2) are represented by synchronous or asynchronous base band transmission methods (BB1, BB2), or by a single-carrier or multi-carrier frequency transmission method.

9. Method according to Claim 8, characterized in that the AMI method, HDB3 method, coded diphase method, or 2B1Q method is provided as the base band transmission method, and the QAM method with different step numbers

and the phase difference method is provided as the carrier frequency transmission method.

**PROCEDURE TO OPTIMIZE DATA TRANSMISSION VIA LINES**


**ABSTRACT**

For different line parameters of lines at least one transmission procedure with a transmission rate representing the maximum throughput rate is determined and stored. In a current data transmission via a line, its line parameters are measured and the transmission procedure is selected with the transmission rate at which the greatest agreement is determined between the measured and stored line parameters, i.e., a maximum data throughput rate.

#5

**Substitute Specification**
**(Marked-up Copy)**

# PROCEDURE FOR OPTIMIZATION OF DATA TRANSMISSION VIA LINES

## CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/02505 which was published in the German Language on February 8, 2001.

## TECHNICAL FIELD OF THE INVENTION

The invention relates to a method for optimizing data transmission.

## BACKGROUND OF THE INVENTION

In the service area ~~of communications~~ or feeder nets of communications systems or networks, different transmission procedures are used to transmit data ~~for~~. For example, digitized voice information or Internet data information via lines may be transmitted via 2-wire or 4-wire lines. Frequently used transmission procedures include the baseband transmission procedure and single-carrier or multi-carrier procedures. Additional echo compensation processes are required for bi-directional data transmission via two-wire lines. Modems frequently use single- or multiple carrier frequency processes, whereby appropriate modulation procedures -- in particular phase modulation procedures -- depending on the transmission rates to be achieved, are applied.

Modems use a default transmission rate that is reduced during temporary interference, which causes a sharp drop in transmission quality. Once the interference is

eliminated or repaired, the modem returns to the original transmission rate.

## SUMMARY OF THE INVENTION

The invention **improves** transmission via lines, in particular service lines to communications systems.

**One** aspect of the invention **includes** being able to determine and store at least one transmission procedure with a transmission rate representing the maximum throughput rate for different line parameters of lines.

Current line data transmission, via a line, measures line parameters, and a given transmission procedure selects a given transmission rate with the best match between measured and stored line parameters. In this respect, the line parameters are represented by line damping and runtime and by interfering signals on a line.

**In one embodiment of** the invention, use of a line or service line **is optimized** by determining maximum data throughput because in the event of error-free maximum data throughput, data throughput depends on the transmission procedure used on a given line or transmission line with interfering signals. In this context, the highest transmission rate with a given transmission procedure does not equal the greatest data throughput.

## ~~Additional~~ BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described below using a drawing, **in which:**

~~The drawing~~ <u>**Figure 1 shows a block diagram of a feeder network in a communications network.**</u>

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

<u>**Figure 1**</u> shows a block diagram with a feeder network AN of a communications network KN, representing, for example, an ISDN communications network or a data communications network such as the Internet. A two-wire line L is supplied with the AN service network, with a transmission unit UE connected to both ends -- in the example this is represented by several lines. A transmission module UE is supplied and connected to the line L and the communications transmitter KE in the transmission unit UM, whereby the transmission module UM can, for example, take the form of two transmission procedures such as two different baseband procedures BB1, BB2 with an echo compensation procedure. Alternatively, for example, single- or multi-carrier frequency procedures such as the OFDM transmission procedure, are possible. A measuring unit ME connected to the line L and a control unit ST are provided in the transmission module UM to measure the line parameters lp of line L.

In the lower area, a dotted line represents the transmission units UE to illustrate the exchange of information.

A preamble P is sent between the transmission modules UM before determining the line parameters (lp) and a procedure is used to switch the two transmission modules UM to the measuring procedure. In this connection, the preamble P information and the procedure are determined using a low transmission rate compared to the following measuring procedure and a simple transmission procedure -

- for example two-stage phase difference modulation or binary frequency modulation --, so that transmission of information is assured even along lines L with low transmission quality, whereby the echo compensation procedure is switched off for a two-wire line L.

Measuring the line parameters lp, i.e., the measuring procedure, can be performed as follows:

(a) a transmission module UM is designated as master (M) or as master transmission module UM (M) -- preferably in communications system KS -- and the other transmission module UM as slave (S) or decentralized transmission module UM (S).

(b) In each of the two transmission modules UM, the interference in line L, i.e., the noise floor signal ts, is measured using measuring unit ME, analyzed for amplitude and frequency, and the results of these analyses saved. Based on the results of the analysis, the master (M) makes an initial selection for a possible transmission procedure BB1, BB2. If the noise floor signal rs **includes** high-level signal frequencies, a transmission procedure BB1, BB2 is initially selected at which these signal frequencies produce no interference.

(c) Using a transmitting preamble P, the slave (S) is informed by coded information which transmission procedure BB1, BB2 and which transmission rate are provided in the measuring procedure.

(d) The selected transmission procedures BB1, BB2 are assigned tables T in two transmission modules UM, which are selected by the currently used transmission procedure BB1, BB2 from a majority of tables T1…Tn that are saved in the transmission modules UM.

(e) The master (M) sends a test signal ts with two frequencies and amplitudes for a given time t1, whereby the frequencies and amplitudes and the times are determined by the table T.

(f) In the slave (S) the amplitudes a of the received test signal ts are measured for individual frequencies and the phase difference pd of the frequencies of the test signal ts are measured using the measuring unit ME. The phase difference fd can be used to determine runtime lz, which are saved along with the measured values of amplitudes a.

(g) Then the slave (S) and the master (M) send out a test signal ts for the given time t2.

(h) The master (M) also determines for each frequency the amplitudes of test signal ts and the phase difference pd using measuring unit ME and runtime lz. Furthermore, the received test signal ts is checked for maximum allowable damping.

If the damping is below that point, the master (M) will transmit an additional test signal ts with two frequencies and amplitudes for a given time t1 to slave S via the line L, whereby the frequencies and amplitudes and time spans t1, t2 again are determined by the table T.

(i) The evaluation described in (g) and (f) is again carried out in the slave (S).

The procedures described in e) through h) are repeated until the frequencies and/or pairs of frequencies in the assigned table T are tested. In this manner, line L is tested in a grid of frequencies. In this regard, the master (M) stops measuring if a test signal ts frequency in the table has too high damping, i.e., line damping.

Based on a decision table in the master (M), the slave (S) is informed for which new transmission procedures BB1, BB2 and at which transmission rate the following measurements are to be carried out. The transmission modules UM select from the tables T and the measurement is assigned. This way several transmission procedures BB1, BB2 are tested and transmission rates are tested, and frequency ranges that are suitable for data transmission in addition to commensurate transmission rates are determined.

To determine transmission procedure BB1, BB2 with the maximum throughput rate, the analysis results are compared with table TD, in which the frequencies and frequency ranges are stored for various transmission procedures BB1, BB2 for different transmission rates, and then those are determined in which the lowest possible damping and runtime distortions occur based on their spectrum. The transmission procedure or procedures chosen are those in which the tested frequency range have the lowest fluctuations in measured damping and runtime lz and, moreover, in which the measured noise floor signal rs has the least effect on throughput rate. The values stored in the tables for the comparisons are determined empirically with a wide variety of transmission procedures and line properties at different frequencies and frequency ranges in test rigs, for example in a test setup. The maximum throughput rate can equal the maximum possible transmission rate, it can however be lower, in particular in the event of heavy interference and/or noise floors that necessitate repeated transmittal of data containing interference. That means that an optimum transmission rate will be determined in which the data throughput rate is optimal The maximum data throughput

rate can also be set at differently measured line parameters lp and different transmission procedures BB1, BB2 by, for example, measuring the error rate and data packet repeat rate.

After selecting the transmission procedure BB1, BB2, corresponding control information sti is sent to transmission module UM, where the selected transmission procedure BB1, BB2 is set. The selection of the suitable transmission procedure BB1, BB2 with optimum transmission rate can be done with every operation of the transmission units UE or at the initial operation of a line L.

The procedure according to the invention is not limited to one embodiment, but can be applied to a wide variety of transmission procedures -- for example different single- or multi-carrier frequency procedures with different carrier modulations, and for a wide range of line types (2-wire and 4-wire line).

GR 99 P 2445

Rec'd PCT/PTO 10 JUN 2002
10/048119

#5

Substitute Specification
(Clean Copy)

# PROCEDURE FOR OPTIMIZATION OF DATA TRANSMISSION VIA LINES

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Modems use a default transmission rate that is reduced during temporary interference, which causes a sharp drop in transmission quality. Once the interference is eliminated or repaired, the modem returns to the original transmission rate.

## SUMMARY OF THE INVENTION

The invention improves transmission via lines, in particular service lines to communications systems.

One aspect of the invention includes being able to determine and store at least one transmission procedure with a transmission rate representing the maximum throughput rate for different line parameters of lines.

Current line data transmission, via a line, measures line parameters, and a given transmission procedure selects a given transmission rate with the best match between measured and stored line parameters. In this respect, the line parameters are represented by line damping and runtime and by interfering signals on a line.

In one embodiment of the invention, use of a line or service line is optimized by determining maximum data throughput because in the event of error-free maximum data throughput, data throughput depends on the transmission procedure used on a given line or transmission line with interfering signals. In this context, the highest transmission rate with a given transmission procedure does not equal the greatest data throughput.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described below using a drawing, in which:

Figure 1 shows a block diagram of a feeder network in a communications network.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a block diagram with a feeder network AN of a communications network KN, representing, for

example, an ISDN communications network or a data communications network such as the Internet. A two-wire line L is supplied with the AN service network, with a transmission unit UE connected to both ends -- in the example this is represented by several lines. A transmission module UE is supplied and connected to the line L and the communications transmitter KE in the transmission unit UM, whereby the transmission module UM can, for example, take the form of two transmission procedures such as two different baseband procedures BB1, BB2 with an echo compensation procedure. Alternatively, for example, single- or multi-carrier frequency procedures such as the OFDM transmission procedure, are possible. A measuring unit ME connected to the line L and a control unit ST are provided in the transmission module UM to measure the line parameters lp of line L.

In the lower area, a dotted line represents the transmission units UE to illustrate the exchange of information.

A preamble P is sent between the transmission modules UM before determining the line parameters (lp) and a procedure is used to switch the two transmission modules UM to the measuring procedure. In this connection, the preamble P information and the procedure are determined using a low transmission rate compared to the following measuring procedure and a simple transmission procedure -- for example two-stage phase difference modulation or binary frequency modulation --, so that transmission of information is assured even along lines L with low transmission quality, whereby the echo compensation procedure is switched off for a two-wire line L.

Measuring the line parameters lp, i.e., the measuring procedure, can be performed as follows:

(a) a transmission module UM is designated as master (M) or as master transmission module UM (M) -- preferably in communications system KS -- and the other transmission module UM as slave (S) or decentralized transmission module UM (S).

(b) In each of the two transmission modules UM, the interference in line L, i.e., the noise floor signal ts, is measured using measuring unit ME, analyzed for amplitude and frequency, and the results of these analyses saved. Based on the results of the analysis, the master (M) makes an initial selection for a possible transmission procedure BB1, BB2. If the noise floor signal rs includes high-level signal frequencies, a transmission procedure BB1, BB2 is initially selected at which these signal frequencies produce no interference.

(c) Using a transmitting preamble P, the slave (S) is informed by coded information which transmission procedure BB1, BB2 and which transmission rate are provided in the measuring procedure.

(d) The selected transmission procedures BB1, BB2 are assigned tables T in two transmission modules UM, which are selected by the currently used transmission procedure BB1, BB2 from a majority of tables T1…Tn that are saved in the transmission modules UM.

(e) The master (M) sends a test signal ts with two frequencies and amplitudes for a given time t1, whereby the frequencies and amplitudes and the times are determined by the table T.

(f) In the slave (S) the amplitudes a of the received test signal ts are measured for individual frequencies and the phase difference pd of the frequencies of the test signal ts are measured using the measuring unit ME. The phase difference fd can be used to determine runtime lz, which are saved along with the measured values of amplitudes a.

(g) Then the slave (S) and the master (M) send out a test signal ts for the given time t2.
(h) The master (M) also determines for each frequency the amplitudes of test signal ts and the phase difference pd using measuring unit ME and runtime lz. Furthermore, the received test signal ts is checked for maximum allowable damping.

If the damping is below that point, the master (M) will transmit an additional test signal ts with two frequencies and amplitudes for a given time t1 to slave S via the line L, whereby the frequencies and amplitudes and time spans t1, t2 again are determined by the table T.
(i) The evaluation described in (g) and (f) is again carried out in the slave (S).

The procedures described in e) through h) are repeated until the frequencies and/or pairs of frequencies in the assigned table T are tested. In this manner, line L is tested in a grid of frequencies. In this regard, the master (M) stops measuring if a test signal ts frequency in the table has too high damping, i.e., line damping. Based on a decision table in the master (M), the slave (S) is informed for which new transmission procedures BB1, BB2 and at which transmission rate the following measurements are to be carried out. The transmission modules UM select from the tables T and the measurement is assigned. This way several transmission procedures BB1, BB2 are tested and transmission rates are tested, and frequency ranges that are suitable for data transmission in addition to commensurate transmission rates are determined.

To determine transmission procedure BB1, BB2 with the maximum throughput rate, the analysis results are

compared with table TD, in which the frequencies and frequency ranges are stored for various transmission procedures BB1, BB2 for different transmission rates, and then those are determined in which the lowest possible damping and runtime distortions occur based on their spectrum. The transmission procedure or procedures chosen are those in which the tested frequency range have the lowest fluctuations in measured damping and runtime lz and, moreover, in which the measured noise floor signal rs has the least effect on throughput rate. The values stored in the tables for the comparisons are determined empirically with a wide variety of transmission procedures and line properties at different frequencies and frequency ranges in test rigs, for example in a test setup. The maximum throughput rate can equal the maximum possible transmission rate, it can however be lower, in particular in the event of heavy interference and/or noise floors that necessitate repeated transmittal of data containing interference. That means that an optimum transmission rate will be determined in which the data throughput rate is optimal The maximum data throughput rate can also be set at differently measured line parameters lp and different transmission procedures BB1, BB2 by, for example, measuring the error rate and data packet repeat rate.

After selecting the transmission procedure BB1, BB2, corresponding control information sti is sent to transmission module UM, where the selected transmission procedure BB1, BB2 is set. The selection of the suitable transmission procedure BB1, BB2 with optimum transmission rate can be done with every operation of the transmission units UE or at the initial operation of a line L.

The procedure according to the invention is not limited to one embodiment, but can be applied to a wide variety

of transmission procedures -- for example different single- or multi-carrier frequency procedures with different carrier modulations, and for a wide range of line types (2-wire and 4-wire line).

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#4

Description

# Procedure for optimization of data transmission via lines

In the service area of communications systems and/or in the feeder nets of communication networks different transmission procedures are used to transmit data, for example digitized voice information or Internet data information via lines, particularly 2-wire or 4-wire lines. Frequently used transmission procedures include the baseband transmission procedure and single-carrier or multi-carrier procedures. Additional echo compensation processes are required for bi-directional data transmission via two-wire lines. Modems frequently use single- or multiple carrier frequency processes, whereby appropriate modulation procedures -- in particular phase modulation procedures -- depending on the transmission rates to be achieved, are applied.

Modems use a default transmission rate that is reduced during temporary interference, which causes a sharp drop in transmission quality. Once the interference is eliminated or repaired, the modem returns to the original transmission rate.

The invention seeks to improve transmission via lines, in particular service lines to communications systems. This task is accomplished by the features of Claim 1.

The essential aspect of the procedure according to the invention consists of being able to determine and store at least one transmission procedure with a transmission rate representing the maximum throughput rate for different line parameters of lines.

Current line data transmission via a line measures line parameters and a given transmission procedure selects a given transmission rate with the best match between measured and stored line parameters. In this respect, the line parameters are represented by line damping and runtime and by interfering signals on a line -- Claim 2.

The basic advantage of the procedure according to the invention consists of achieving optimum use of a line or service line by determining maximum data throughput because in the event of error-free maximum data throughput, data throughput depends on the transmission procedure used on a given line or transmission line with interfering signals. In this context, the highest transmission rate with a given transmission procedure does not equal the greatest data throughput.

Additional advantageous embodiments of the procedure according to the invention, in particular with regard to determining maximum data throughput rate and line parameters and advantageous transmission procedures can be found in the claims below.

The procedure according to the invention is described below using a drawing.

The drawing shows a block diagram with a feeder network AN of a communications network KN, representing, for example, an ISDN communications network or a data communications network such as the Internet. A two-wire line L is supplied with the AN service network, with a transmission unit UE connected to both ends -- in the example this is represented by several lines. A transmission module UE is supplied and connected to the line L and the communications transmitter KE in the transmission unit UM, whereby the transmission module UM

can, for example, take the form of two transmission procedures such as two different baseband procedures BB1, BB2 with an echo compensation procedure. Alternatively, for example, single- or multi-carrier frequency procedures such as the OFDM transmission procedure, are possible. A measuring unit ME connected to the line L and a control unit ST are provided in the transmission module UM to measure the line parameters lp of line L.

In the lower area, a dotted line represents the transmission units UE to illustrate the exchange of information.

A preamble P is sent between the transmission modules UM before determining the line parameters (lp) and a procedure is used to switch the two transmission modules UM to the measuring procedure. In this connection, the preamble P information and the procedure are determined using a low transmission rate compared to the following measuring procedure and a simple transmission procedure -- for example two-stage phase difference modulation or binary frequency modulation --, so that transmission of information is assured even along lines L with low transmission quality, whereby the echo compensation procedure is switched off for a two-wire line L.

Measuring the line parameters lp, i.e., the measuring procedure, can be performed as follows:

(a) a transmission module UM is designated as master (M) or as master transmission module UM (M) -- preferably in communications system KS -- and the other transmission module UM as slave (S) or decentralized transmission module UM (S).

(b) In each of the two transmission modules UM, the interference in line L, i.e., the noise floor signal ts,

is measured using measuring unit ME, analyzed for amplitude and frequency, and the results of these analyses saved. Based on the results of the analysis, the master (M) makes an initial selection for a possible transmission procedure BB1, BB2. If the noise floor signal rs contains high-level signal frequencies, a transmission procedure BB1, BB2 is initially selected at which these signal frequencies produce no interference.

(c) Using a transmitting preamble P, the slave (S) is informed by coded information which transmission procedure BB1, BB2 and which transmission rate are provided in the measuring procedure.

(d) The selected transmission procedures BB1, BB2 are assigned tables T in two transmission modules UM, which are selected by the currently used transmission procedure BB1, BB2 from a majority of tables T1…Tn that are saved in the transmission modules UM.

(e) The master (M) sends a test signal ts with two frequencies and amplitudes for a given time t1, whereby the frequencies and amplitudes and the times are determined by the table T.

(f) In the slave (S) the amplitudes a of the received test signal ts are measured for individual frequencies and the phase difference pd of the frequencies of the test signal ts are measured using the measuring unit ME. The phase difference fd can be used to determine runtime lz, which are saved along with the measured values of amplitudes a.

(g) Then the slave (S) and the master (M) send out a test signal ts for the given time t2.

(h) The master (M) also determines for each frequency the amplitudes of test signal ts and the phase difference pd using measuring unit ME and runtime lz. Furthermore, the received test signal ts is checked for maximum allowable damping.

If the damping is below that point, the master (M) will transmit an additional test signal ts with two frequencies and amplitudes for a given time t1 to slave S via the line L, whereby the frequencies and amplitudes and time spans t1, t2 again are determined by the table T.

(i) The evaluation described in (g) and (f) is again carried out in the slave (S).

The procedures described in e) through h) are repeated until all of the frequencies and/or pairs of frequencies in the assigned table T are tested. In this manner, line L is tested in a grid of frequencies. In this regard, the master (M) stops measuring if a test signal ts frequency in the table has too high damping, i.e., line damping. Based on a decision table in the master (M), the slave (S) is informed for which new transmission procedures BB1, BB2 and at which transmission rate the following measurements are to be carried out. The transmission modules UM select from the tables T and the measurement is assigned. This way several transmission procedures BB1, BB2 are tested and transmission rates are tested, and frequency ranges that are suitable for data transmission in addition to commensurate transmission rates are determined.

To determine transmission procedure BB1, BB2 with the maximum throughput rate, the analysis results are compared with table TD, in which the frequencies and frequency ranges are stored for various transmission procedures BB1, BB2 for different transmission rates, and then those are determined in which the lowest possible damping and runtime distortions occur based on their spectrum. The transmission procedure or procedures chosen are those in which the tested frequency range have the lowest fluctuations in measured damping and runtime lz

and, moreover, in which the measured noise floor signal rs has the least effect on throughput rate. The values stored in the tables for the comparisons are determined empirically with a wide variety of transmission procedures and line properties at different frequencies and frequency ranges in test rigs, for example in a test setup. The maximum throughput rate can equal the maximum possible transmission rate, it can however be lower, in particular in the event of heavy interference and/or noise floors that necessitate repeated transmittal of data containing interference. That means that an optimum transmission rate will be determined in which the data throughput rate is optimal The maximum data throughput rate can also be set at differently measured line parameters lp and different transmission procedures BB1, BB2 by, for example, measuring the error rate and data packet repeat rate.

After selecting the transmission procedure BB1, BB2, corresponding control information sti is sent to transmission module UM, where the selected transmission procedure BB1, BB2 is set. The selection of the suitable transmission procedure BB1, BB2 with optimum transmission rate can be done with every operation of the transmission units UE or at the initial operation of a line L.

The procedure according to the invention is not limited to one embodiment, but can be applied to a wide variety of transmission procedures -- for example different single- or multi-carrier frequency procedures with different carrier modulations, and for a wide range of line types (2-wire and 4-wire line).

Claims

1. Procedure to optimize data transmission via lines (L)

- wherein for different line parameters (lp') of lines (L) at least one transmission procedure (BB1, BB2) with at least one of the represented maximum data throughput rates transmission rates is determined and stored,

- wherein its line parameters (lp) are measured using at least one transmission procedure (BB1, BB2) via a line (L)

- wherein a given transmission procedure (BB1, BB2) is selected with the transmission rate at which there is greatest compatibility between the measured and stored line parameters (lp, lp').

2. Procedure according to Claim 1, in which the line parameters (lp) are represented by the line's damping and runtime (lz) and by an interfering signal (rs) on a line (L).

3. Procedure according to Claim 2, wherein the runtime (lz) is determined by measuring the phase difference (pd) between two signals (ts), one of which generated using a transmission procedure (BB1, BB2) with different frequencies.

4. Procedure according to one of the previous Claims, wherein the maximum data throughput rate for different line parameters (lp') is determined with different transmission procedures (BB1, BB2) and transmission rates by selecting those transmission procedures (BB1, BB2) in whose frequency range the line parameters (lp) of damping and runtime (lz) show the lowest fluctuations and in which the interfering signal (rs) has the least effect,

and the line parameters (lp') representing the maximum throughput rate are stored.

5. Procedure according to one of the previous Claims, wherein prior to the beginning of a data transmission, a measuring procedure is initiated with which

(a) one end of the line (L) is set as master (M) and the other as slave (S),

(b) prior to measuring the line parameters (lp), the line (L) noise floor (rs) is measured

(c) after the master (M) measures the noise floor, a transmission procedure (BB1, BB2) is selected and the slave (S) is informed.

(d) using stored line parameters (lp) for the selected transmission procedure (BB1, BB2) from the master (M), a given test signal (ts) is emitted with two different frequencies and the test signal's (ts) line parameters (lp) are measured by the slave (S), followed by the slave (S) transmitting a test signal (ts) to the master (M),

(e) the master (M) checks the damping of the test signal (ts) and depending on the damping measured, additional test signals (ts) are sent to the slave (S)

(f) steps (d) and (e) are repeated until the stored line parameters (lp) are run through, and

(g) the measured line parameters (lp) are compared to the stored line parameters (lp') and set depending on the result of the comparison between transmission procedure BB1, BB2 and the transmission rate.

6. Procedure according to Claim 5, wherein the stored line parameters (lp') are stored in tables (T1...Tn), whereby the tables (T1...Tn, TD) are assigned to the different transmission procedures (BB1, BB2) with different transmission rates, and the selection of a transmission procedure (BB1, BB2) to determine the line parameters (lp) and to determine the transmission

procedure with the maximum throughput rate by comparing the determined line parameters (lp) with the line parameters (lp') stored in the tables (T1...Tn, TD).

7. Procedure according to one of the previous Claims, wherein a transmission unit (UE) is connected to each end of the line (L), whereby one transmission unit (UE) is connected to communications terminal equipment (KE) and the other transmission unit (UE) is connected to a communications system (KS).

8. Procedure according to one of the previous Claims, wherein the transmission procedures (BB1, BB2) are represented by synchronous and/or asynchronous baseband transmission procedures (BB1, BB2) or by a single- or multi-frequency transmission procedure

10. Procedure according to Claim 9, wherein the AMI, HDB3, coded diphase or 2B1Q procedure is provided as baseband transmission procedure and the QAM procedure with different number of stages and the phase difference procedure are provided as carrier frequency transmission procedures.

Summary

Procedure to optimize data transmission via lines

For different line parameters (lp') of lines (L) at least one transmission procedure (BB1, BB2) with a transmission rate representing the maximum throughput rate is determined and stored.. In a current data transmission via a line, its line parameters (lp) are measured and the transmission procedure (BB1, BB2) is selected with the transmission rate at which the greatest agreement is determined between the measured and stored line parameters (lp, lp'), i.e., a maximum data throughput rate.

Fig.

# Declaration and Power of Attorney For Patent Application
## *Erklärung Für Patentanmeldungen Mit Vollmacht*
### German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehorigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprunglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

Verfahren zum Optimieren der Datenübertragung über Leitungen

deren Beschreibung

(zutreffendes ankreuzen)
☐ hier beigefugt ist.
☒ am 28.07.2000 als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/02505
eingereicht wurde und am _______
abgeändert wurde (falls tatsächlich abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwahnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Method for optimizing the transmission of data via lines

the specification of which

(check one)
☐ is attached hereto.
☒ was filed on 28.07.2000 as
PCT international application
PCT Application No. PCT/DE00/02505
and was amended on _______
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

## German Language Declaration

Prior foreign appplications
Priorität beansprucht

Priority Claimed

| | | | | |
|---|---|---|---|---|
| 19935997.0<br>(Number)<br>(Nummer) | DE<br>(Country)<br>(Land) | 30.07.1999<br>(Day Month Year Filed)<br>(Tag Monat Jahr eingereicht) | ☒ Yes<br>Ja | ☐ No<br>Nein |
| (Number)<br>(Nummer) | (Country)<br>(Land) | (Day Month Year Filed)<br>(Tag Monat Jahr eingereicht) | ☐ Yes<br>Ja | ☐ No<br>Nein |
| (Number)<br>(Nummer) | (Country)<br>(Land) | (Day Month Year Filed)<br>(Tag Monat Jahr eingereicht) | ☐ Yes<br>Ja | ☐ No<br>Nein |

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1 56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application

| | | | |
|---|---|---|---|
| PCT/DE00/02505<br>(Application Serial No.)<br>(Anmeldeseriennummer) | 28.07.2000<br>(Filing Date D, M, Y)<br>(Anmeldedatum T, M, J) | anhängig<br>(Status)<br>(patentiert, anhängig, aufgegeben) | pending<br>(Status)<br>(patented, pending, abandoned) |
| (Application Serial No.)<br>(Anmeldeseriennummer) | (Filing Date D,M,Y)<br>(Anmeldedatum T, M; J) | (Status)<br>(patentiert, anhängig, aufgeben) | (Status)<br>(patented, pending, abandoned) |

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

## German Language Declaration

| | |
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| VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: *(Name und Registrationsnummer anführen)* | POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)* |
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*(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben)*

*(Supply similar information and signature for third and subsequent joint inventors).*